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THE CHARACTER OF THE ARCTIC SEA ICE COVER FROM ACTIVE AND PASSIVE MICROWAVE OBSERVATIONS

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By definition, ice which survives the summer is call multiyear ice. Thus, multiyear ice concentration during winter should be consistent with ice concentration during the previous summer minima, This constraining condition provides a good validation for multiyear ice concentration derived during the winter season. In the SSM/I case, there are operational techniques for retrieval of these ice parameters for both seasons. The brightness temperatures observed at different wavelengths and polarizations are combined to estimate multiyear ice concentration during winter. This is not possible during summer, because during this time, the passive microwave signature for multiyear ice is lost due to surface effects (e.g., melt and meltponding). However, total ice concentration can be retrieved from passive microave during the summer if the appropriate reference tempera- ture is used for different regions. For SAR, it has been demonstrated that the MY signatures are relatively stable during winter and a simple unsupervised algorithm can be implemented to provide consistent estimates of MY ice concentrations during the winter. During the summer, a supervised technique which takes advantage of the high backscatter of wind-roughened open water as a discrimination feature has been proposed for estimation of ice fraction. Using these procedures, we demonstrate with a yearlong dataset from the Beaufort that data from ERS- 1 SAR provides a very stable and consistent estimate of the MY fraction in the winter which is comparable to the ice fraction estimated at the end of the previous summer. We contrast this with the variability of the MY ice concentration and ice fraction estimates obtained using SSMI data. The SSM/I algorithms also seem to provide results that are consistently lower than those from the SAR data. Error analysis is implemented on both active and passive retrievals and the results suggest that the accuracy with which the SSM/I algorithms can characterize the ice cover should be re-evaluated.